

that is, its square is the sum of the square of the probable error at this epoch and the product of the square of the probable error of the rate into the square of the interval from this epoch, (1). Hence the square of the probable error of the clock correction at this epoch is equal to the square of the probable error of the clock correction at the assumed epoch minus the product of the square of the probable error of the rate into the square of the interval between the two epochs.

Example.

Number of stars observed, 20. Number of quantities determined, 5.

Putting v here for the residuals, $[vvv] = 0^s.0251$.

For an observation of weight 1, $p^2 = 0^s.000761 = [6.8815]$.

Mean of the times of observation = $8^h.98$. Assumed epoch of $\Delta T_0 = 9^h.0$.

$$[ee.4] = 3.28, (p\Delta T_0)^2 = [6.8815] \div [0.5159] = [6.3656] = 0^s.000232.$$

$$[dd.4] = 4.44, (pp)^2 = [6.8815] \div [0.6474] = [6.2341] = 0^s.000171.$$

$$[de.3] = +5.75 = [0.7597], [ee.3] = +6.85 = [0.8357], t' = [9.9240] = 0^h.84.$$

Epoch of maximum coefficient = $9^h.84$.

$$(p\Delta T_{00})^2 = 0^s.000232 - 0^s.000171 \cdot (0.84)^2 = 0^s.000111, p\Delta T_{00} = \pm 0^s.011.$$

$$\text{At time } T, p\Delta T = \pm \sqrt{0^s.000111 + 0^s.000171 \cdot (T - 9^h.84)^2}.$$

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On the Photographic Magnitude of Nova Aurigæ, as Determined at the Royal Observatory, Greenwich. II. By W. H. M. Christie, M.A., F.R.S., Astronomer Royal.

In the *Monthly Notices* for last March (vol. lii. p. 357) results for the photographic magnitude of *Nova Aurigæ* were given as determined up to March 9. Since then photographs have been taken up to April 1, when the photographic magnitude had fallen below 14, and again at the end of August and beginning of September, when the star had brightened. Further measures were also made of the earlier photographs, modifying slightly the results given in the previous paper. The measures were made and reduced in the manner explained in that paper, the magnitude of the *Nova* being inferred by comparison with four Argelander stars of 8-9 magnitude by means of the formula

$$m = 2.5 (\log t - 0.97 \sqrt{d}) + \text{const.}$$

given in the *Monthly Notices*, vol. lii. p. 146, the measures of diameter of the four comparison stars being used to determine

the value of the constant for each plate. Their magnitudes taken from Argelander are: B.D. $+30^{\circ}944$, 8.2; $+30^{\circ}949$, 8.2; $+30^{\circ}938$, 8.7; $+30^{\circ}913$, 8.7; and it is assumed that the mean magnitude of the four stars is 8.45.

The results are given in the accompanying Table I. The initials A.E., E.R., A.R., W.C., C. are those of Miss Everett, Miss Rix, Miss Russell, Mr. Christie, and Mr. Criswick respectively.

TABLE I.

Photographic Magnitude of Nova Aurigæ from Comparisons with Four Stars, 8-9 Mag.

1892.		A.E. Mag.	E.R. Mag.	A.R. Mag.	W.C. Mag.	C. Mag.	Mean Adopted Magnitude.
Feb.	1	4.29 ₁	4.60 ₁	4.51 ₁	4.53 ₁	4.56 ₁	4.50
	2	3.71 ₈	3.14 ₈	3.75 ₈	...	3.81 ₈	3.69
	3	3.69 ₈	3.45 ₈	...	3.60 ₃	...	3.57
	12	4.23 ₄	3.66 ₄	...	3.46 ₃	...	3.81
	13	4.50 ₈	4.28 ₈	4.37 ₃	...	...	4.39
	18	3.99 ₆	3.72 ₆	3.95 ₈	...	4.15 ₅	3.94
	22	4.83 ₈	...	4.34 ₅	...	...	4.61
Mar.	7	5.05 ₈	...	...	...	...	5.05
	9	6.30 ₇	...	...	...	...	6.30
	10	6.77 ₂	...	6.50 ₂	...	...	6.64
	14	8.10 ₂	...	7.87 ₁	...	...	8.02
	15	8.03 ₃	...	7.86 ₃	...	...	7.95
	15	8.64 ₃	...	8.62 ₃	...	...	8.63
	18	9.47 ₂	...	9.61 ₃	...	...	9.55
	18	9.03 ₂	...	9.47 ₃	...	...	9.25
	19	10.03 ₃	...	10.08 ₃	...	...	10.06
	24	11.78 ₂	...	11.27 ₂	...	...	11.53
	28	12.48 ₃	...	13.26 ₃	...	11.68 ₂	12.57
	30	13.08 ₂	...	13.63 ₂	...	...	13.36
Apr.	1	14.53 ₁	...	14.21 ₁	...	...	14.37
Aug.	30	11.63 ₂	...	12.47 ₂	11.77 ₂	11.24 ₂	11.78
Sept.	3	11.72 ₂	...	13.11 ₂	...	...	12.42
	5	...	...	12.55 ₃	...	...	12.55
	6	11.73 ₄	...	12.07 ₄	...	...	11.90

The number of images of the *Nova* measured on each day is indicated by the suffix, the exposures ranging generally from 15^s to 12^m, as shown in the previous paper. This scale of exposures was, however, to some extent modified when the *Nova* got

too faint to be shown with the short exposures, and the following is a list of the exposures from March 19: March 19 and 24, 12^m, 4^m, 1^m; March 28, 12^m, 6^m; March 30, 20^m, 10^m, 30^s, 15^s; April 1, 30^m, 15^m, 30^s, 15^s; August 30 and September 3, 12^m, 4^m, 1^m; September 5, 12^m, 5^m, 4^m, 1^m; September 6, 8½^m, 4^m, 2¼^m, 1^m, 30^s. On March 30 the *Nova* was shown with an exposure of 10^m, on April 1 with an exposure of 30^m, and on September 6 with an exposure of 1^m.

On March 15 and 18 two sets of exposures were given, the first with the *Nova*, and the second with the 5.7 mag. star B.D. +30°898, at the centre of the plate, the *Nova* in the second set being about 60' from that centre. These plates were taken to test whether distance from the centre would appreciably affect the determination of photographic magnitude.

The following are the values of photographic magnitude of B D + 30°898 deduced in the two cases:—

Star 60' from centre of plate.

Exposure.	1892 March 15, Plate 293.		March 18, Plate 296.	
	A.E.	A.R.	A.E.	A.R.
12 ^m	4.79	4.59	4.41	4.50
30 ^s	4.51	4.36	4.31	4.29
15 ^s	4.06	3.96	4.24	4.24
Mean of 3 ...	4.45	4.30	4.32	4.34
Mean of all exposures	...	...	...	4.36

Star at centre of plate.

12 ^m	4.39	4.31	4.84	4.34
30 ^s	4.24	4.11	3.91	4.22
15 ^s	4.11	3.96	3.99	3.97
Mean of 3 ...	4.25	4.13	4.25	4.18
Mean of all exposures	...	...	...	4.20

In connection with these measures it may be of interest to give the value of the constant deduced from each plate (the meaning of which has been explained in the previous paper, p. 364), Table II., and the results obtained for the photographic magnitudes of the four comparison stars referred to the mean of the four, which is assumed from Argelander to be 8.45, Tables III. and IV.

In explanation of the small values of the constant in some cases, it is to be remarked that several of the nights on which the photographs were taken were cloudy or hazy. This was the case on March 7, 9, 10, 14, and 15.

TABLE II.

Values of the Constant for each Plate from Measures of the Four Comparison Stars, 8-9 Mag.

1892.		A.E. Const.	E.R. Const.	A.R. Const.	W.C. Const.	O. Const.	Mean Value of Constant.
Feb.	1	10·22 ₁	10·30 ₁	9·86 ₁	10·23 ₁	10·71 ₁	10·26
	2	9·05 ₃	...	8·64 ₃	...	9·24 ₃	8·98
		8·43 ₂	...	8·32 ₂	...	8·71 ₂	8·49
		9·51 ₃	9·23 ₃	9·27 ₃	...	9·87 ₃	9·47
	3	9·15 ₃	8·74 ₃	...	...	...	8·95
		8·55 ₂	8·12 ₂	...	...	...	8·34
		8·77 ₃	8·42 ₃	...	8·61 ₃	...	8·60
	12	9·28 ₃	8·65 ₃	...	8·65 ₃	...	8·86
		8·82 ₁	8·86 ₁	...	...	...	8·84
	13	8·60 ₂	8·46 ₂	...	...	...	8·53
		8·53 ₃	7·96 ₃	8·04 ₃	...	...	8·18
		8·36 ₃	7·71 ₃	...	...	...	8·04
	18	9·07 ₃	9·01 ₃	9·23 ₃	...	...	9·10
		...	...	9·56 ₂	...	9·89 ₂	9·73
		9·24 ₃	9·22 ₃	9·38 ₃	...	9·55 ₃	9·35
	22	9·70 ₃	...	9·41 ₃	...	...	9·56
		...	...	9·74 ₂	...	...	9·74
		9·96 ₃	...	...	...	...	9·96
Mar.	7	8·82 ₃	...	...	...	...	8·82
		8·34 ₃	...	...	...	...	8·34
	9	8·96 ₃	...	...	...	...	8·96
		8·35 ₄	...	...	...	...	8·35
	10	7·47 ₂	...	7·29 ₂	...	...	7·38
	14	6·19 ₁	...	6·22 ₁	...	...	6·21
	15	8·84 ₃	...	8·69 ₃	...	...	8·77
		8·45 ₂	...	8·21 ₂	...	...	8·33
	18	9·19 ₃	...	9·12 ₃	...	...	9·16
		9·04 ₃	...	8·81 ₃	...	...	8·93
	19	9·23 ₃	...	9·18 ₃	...	...	9·21
	24	9·10 ₃	...	8·67 ₃	...	...	8·89
	28	8·54 ₂	...	8·55 ₂	...	8·69 ₂	8·59
		8·37 ₂	...	8·36 ₂	...	...	8·37
	30	9·46 ₄	...	9·58 ₄	...	...	9·52
Apr.	1	8·83 ₄	...	8·83 ₄	...	...	8·83
Aug.	30	9·59 ₃	...	9·94 ₃	9·63 ₃	9·78 ₃	9·74
Sept.	3	9·18 ₃	...	9·58 ₃	...	...	9·38
	5	...	...	10·03 ₄	...	...	10·03
	6	9·43 ₄	...	9·53 ₄	...	...	9·48
		8·90 ₁	...	9·25 ₁	...	...	9·08

Nov. 1892.

of Nova Aurigæ.

31

TABLE III.

Photographic Magnitudes of the Four Comparison Stars, referred to the Mean of the Four.

Date. 1892.	Measurer.	B.D. + 30° 944. Mean.	+ 30° 949. Mean.	+ 30° 938. Mean.	+ 30° 913. Mean.	
Feb.	1	A.E.	7.99 ₁	8.31 ₁	8.81 ₁	8.47 ₁
		E.R.	8.05 ₁ 7.97	8.27 ₁ 8.25	8.80 ₁ 8.83	8.67 ₁ 8.67
		A.R.	7.88 ₁	8.18 ₁	8.88 ₁	8.86 ₁
	2	A.E.	7.89 ₈	8.40 ₈	8.67 ₈	8.84 ₈
		E.R.	7.91 ₃ 7.92	8.49 ₃ 8.35	8.63 ₃ 8.68	8.78 ₃ 8.85
		A.R.	7.96 ₈	8.24 ₈	8.71 ₈	8.89 ₈
	3	A.E.	8.06 ₈ 7.99	8.54 ₈ 8.51	8.61 ₈ 8.61	8.74 ₇ 8.80
		E.R.	7.91 ₈	8.48 ₈	8.60 ₈	8.86 ₇
	12	A.E.	7.97 ₄ 8.01	8.24 ₄ 8.19	8.64 ₄ 8.74	9.03 ₃ 8.95
		E.R.	8.04 ₄	8.13 ₄	8.83 ₄	8.86 ₃
	13	A.E.	8.03 ₈	8.30 ₈	8.65 ₈	8.84 ₈
		E.R.	8.00 ₈ 8.02	8.32 ₈ 8.24	8.59 ₈ 8.65	8.88 ₈ 8.85
		A.R.	8.05 ₃	8.17 ₃	8.79 ₃	8.80 ₃
	18	A.E.	7.84 ₆	8.10 ₆	8.70 ₆	9.16 ₆
		E.R.	7.93 ₆ 7.84	7.87 ₆ 8.01	8.68 ₆ 8.71	9.34 ₆ 9.25
		A.R.	7.78 ₈	8.03 ₈	8.75 ₈	9.24 ₈
	22	A.E.	8.00 ₆ 8.42	8.24 ₆ 8.22	8.78 ₆ 8.79	8.78 ₆ 8.82
		A.R.	8.93 ₅	8.19 ₅	8.80 ₅	8.87 ₅
Mar.	7	A.E.	7.84 ₆ 7.84	8.37 ₆ 8.37	8.72 ₆ 8.72	8.89 ₆ 8.89
		A.R.	8.04 ₇ 8.04	8.27 ₇ 8.27	8.63 ₇ 8.63	8.86 ₇ 8.86
	10	A.E.	7.82 ₂ 7.87	8.39 ₂ 8.46	8.56 ₂ 8.55	9.05 ₂ 8.95
		A.R.	7.92 ₂	8.52 ₂	8.53 ₂	8.85 ₂
	14	A.E.	7.77 ₂ 7.77	8.12 ₁ 8.02	8.59 ₁ 8.68	9.32 ₁ 9.34
		A.R.	7.77 ₁	7.92 ₁	8.77 ₁	9.35 ₁
	15	A.E.	8.13 ₃ 8.19	8.59 ₂ 8.38	8.81 ₂ 8.80	8.43 ₃ 8.53
		A.R.	8.24 ₃	8.16 ₂	8.78 ₂	8.63 ₃
	15	A.E.	...	...	...	9.20 ₁ 8.87
		A.R.	...	...	...	8.71 ₂
	18	A.E.	7.49 ₃ 7.50	8.46 ₃ 8.54	8.65 ₃ 8.67	9.21 ₃ 9.11
		A.R.	7.51 ₃	8.61 ₃	8.69 ₃	9.01 ₃
	18	A.E.	...	...	...	8.70 ₃ 8.70
		A.R.	...	...	...	8.70 ₃

Date. 1892.	Measurer.	B.D.+30° 944. Mean.	+30° 949. Mean	938. Mean.	913. Mean.
Mar. 19	A.E.	7.78 ₃ 7.85	8.29 ₃ 8.27	8.74 ₃ 8.72	8.99 ₃ 8.98
	A.R.	7.91 ₃	8.24 ₃	8.69 ₃	8.97 ₃
24	A.E.	...	...	...	8.70 ₃ 8.70
	A.R.	...	...	...	8.70 ₃
28	A.E.	8.05 ₁ 8.00	8.52 ₁ 8.33	8.85 ₁ 8.83	8.65 ₁ 8.78
	A.R.	7.95 ₁	8.13 ₁	8.80 ₁	8.91 ₁
30	A.E.	8.03 ₁ 8.06	8.04 ₁ 8.17	8.77 ₁ 8.72	8.98 ₁ 8.86
	A.R.	8.09 ₁	8.30 ₁	8.67 ₁	8.73 ₁
Apr. 1	A.E.	7.95 ₁ 7.95	8.36 ₁ 8.25	8.80 ₁ 8.86	8.67 ₁ 8.73
	A.R.	7.95 ₁	8.13 ₁	8.91 ₁	8.79 ₁
Aug. 30	A.E.	8.05 ₃ 8.05 ₃	8.36 ₃ 8.35 ₃	8.76 ₃ 8.76	8.65 ₃ 8.68
	A.R.	8.04 ₃	8.33 ₃	8.75 ₃	8.70 ₃
Sept. 3	A.E.	8.06 ₃ 8.03	8.24 ₃ 8.24	8.68 ₃ 8.69	8.84 ₃ 8.86
	A.R.	7.99 ₃	8.24 ₃	8.69 ₃	8.87 ₃
5	...	...	...	...	...
	A.R.	7.75 ₁ 7.75	8.69 ₁ 8.69	8.62 ₁ 8.62	8.83 ₁ 8.83
6	A.E.	7.89 ₅ 7.85	8.03 ₅ 8.11	8.89 ₅ 8.81	9.01 ₅ 8.95
	A.R.	7.81 ₅	8.18 ₅	8.72 ₅	8.89 ₅

TABLE IV.

Mean Photographic Magnitudes of the Four Comparison Stars.

Measurer.	1st Star. B D+30°. No. 944.	2nd Star. +30°. No. 949.	3rd Star. +30°. No. 938.	4th Star. +30°. No. 913.
A.E.	7.95 ₈₉	8.31 ₈₈	8.71 ₈₈	8.85 ₉₄
E.R.	7.96 ₃₀	8.26 ₃₀	8.65 ₃₀	8.95 ₂₈
A.R.	7.91 ₆₁	8.24 ₆₃	8.74 ₆₃	8.88 ₇₂
W.C.	7.97 ₁₀	8.28 ₁₀	8.74 ₁₀	8.80 ₈
C.	7.92 ₁₉	8.42 ₁₉	8.67 ₁₉	8.80 ₁₉
Mean of 1st 3 Ob- servers' Measures	7.94 ₁₈₃	8.28 ₁₈₁	8.71 ₁₈₁	8.88 ₁₉₄
Mean of all the Measures.	7.94 ₂₁₂	8.29 ₂₁₀	8.71 ₂₁₀	8.87 ₂₂₁

The results for photographic magnitude of the four comparison stars may serve to show the degree of consistency which may be expected in determinations of magnitude deduced from measures of diameter of star-disks.

Royal Observatory, Greenwich:
1892 November 11.

Estimations of Magnitude of Nova Aurigæ, made with the Barclay Equatoreal, at the Radcliffe Observatory, Oxford.

(Communicated by E. J. Stone, Esq., M.A., F.R.S., Radcliffe Observer.)

	Observer.	Power of Eye-piece used.	Observed Magnitude of <i>Nova</i> .	Comparison Stars.	Remarks.
Sept. 1892. h	R.	85	9.5	<i>a, k, h</i>	Moonlight.
	R.	"	9.5	<i>a, k, h</i>	
	R.	"	9.4	<i>a, k, h</i>	<i>Nova</i> possibly a trifle brighter than on September 13.
	R.	"	9.6	<i>a, k, h</i>	
	W.	"	9.9	<i>a, k, h, g, i</i>	
	R.	"	9.4	<i>a, k, h</i>	
	R.	"	9.6	<i>a, k, h</i>	
	R.	"	9.5	<i>a, k, h</i>	Moonlight.
	R.	"	9.5	<i>a, k, h</i>	
	R.	"	9.5	<i>a, k, h</i>	Moon near. <i>Nova</i> at times nearly as faint as <i>a</i> .
D	W.	"	10.0	<i>a, k, h, g, i</i>	
	"	100	9.9	<i>c, g, i</i>	Images not sharp with any power, but ξ is visible.
	"	180	9.9	<i>a, k, h, g, i</i>	